

# Power Supplies: A Hidden Opportunity for Energy Savings

Chris Calwell  
VP, Policy and Research  
Ecos Consulting

Ecos Consulting recently concluded an extensive research effort into the energy efficiency of AC/DC power supplies, funded by the U.S. EPA and the Natural Resources Defense Council. We provided a summary of key findings at the most recent PSMA board meeting in Dallas, but have now completed our research and offer the following thoughts to interested members of the power supply industry.

Nearly 2.5 billion electrical products containing power supplies are currently in use in the United States, and about 400 to 500 million new power supplies (linear and switching) are sold in the U.S. each year. The total amount of electricity that flows through these power supplies is more than 207 billion kwh/year, or about 6% of the national electric bill. *About a third of that, or 2% of all U.S. electricity use, is currently wasted as heat in power supplies.* More efficient designs could save about 32 billion kwh/year, cutting the annual national energy bill by \$2.5 billion, displacing the power output of seven large nuclear or coal-fired power plants, and reducing carbon dioxide emissions by more than 24 million tons per year.

Although most of the public attention has been focused on *standby* electricity use, we found that about 73% of all the energy consumed by power supplies occurs when the products they are powering are in *active* use. This is especially important for office equipment and other products used in commercial buildings during peak times, because of associated air conditioning loads and demand charges. Though the more efficient power supplies cost more initially, they typically pay for themselves in energy savings after only a year or two of use.

We make the following recommendations to capture those energy savings:

- Manufacturers and consumers would benefit greatly from an effort to label power supply efficiency in a clear, standardized way (see Figure 1). Curves that quantify efficiency across the full range of operating conditions (standby and active) would allow specifiers to readily identify and buy products that are more efficient overall. They would also give manufacturers a more useful way to market relative power supply performance than maximum output wattage, which tends to lead to oversized power supplies.
- Promising end-uses for an early focus on improved power supply efficiency include television sets, computers, and monitors. In the case of PC's specifically, Intel's PC Design Guide specifications offer a near-term savings opportunity across the millions of computers currently sold each year with oversized power supplies, a nominal efficiency of 68%, and an actual (part-load) efficiency of far less.
- We also see compelling opportunities with battery chargers, especially the standalone type used for typical consumer battery sizes. Our measurements of consumer battery chargers show typical system energy efficiencies of only 5 to 35% at present, which means the 65 to 95% of the AC electricity drawn to charge batteries is never retrievable from the batteries in actual use.

- Voluntary efficiency labeling programs such as ENERGY STAR should account for all energy-consuming modes – active, sleep, and standby – when specifications are created or updated for consumer electronics, office equipment, telecommunications products, and appliances. Doing so will increase overall energy savings significantly, since most products consume more energy in active mode than during the longer periods of time when they are not in use. It may make sense to label or regulate power supplies themselves, given their pervasive use in such a diverse array of products.
- State, federal, and international efficiency standards offer a promising long-term solution. The European Union’s “Code of Conduct” process for external power supplies is already moving in that direction. Likewise, standards-setting bodies in the U.S. may build on the President’s recent Executive Order requiring that federal agencies purchase products with low standby consumption. The government could move to require that power supplies meet minimum percentage efficiency guidelines at 25, 50, 75 and 100% of rated load, as well as having standby consumption of less than 1 or 2 watts.

If you are interested in reading the full paper or discussing these findings in more detail, contact the author at [calwell@ecosconsulting.com](mailto:calwell@ecosconsulting.com) or Noah Horowitz at [nhorowitz@nrdc.org](mailto:nhorowitz@nrdc.org).

Figure 1 – An example of how efficiency curves can be used to compare the performance of power supplies. Note the first power supply wastes nearly a watt of power when not in use and more than 2 watts at full load, while providing useful output of less than 3 watts! The second power supply operates efficiently across a full range of load conditions.

